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UNITED STATES DEPARTMENT OF AGRICULTURE
STATES RELATIONS SERVICE
WASHINGTON, D. C.

OFFICE OF
COOPERATIVE EXTENSION WORK

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June 13, 1923.

MEMORANDUM TO STATE EXTENSION PATHOLOGISTS.

THE EXTENSION PATHOLOGIST

In order that pathologists who are engaged in extension work in the different states may have a medium for exchange of views on matters relating to methods of conducting their work, it is planned to establish a news sheet,--"The Extension Pathologist." Material contributed by the project leaders in the states and others interested in the work will be assembled in Washington, mimeographed, and mailed to extension pathologists, state directors of extension, and a limited number of others who have a direct interest in field activities.

SEED TREATMENT THE SUBJECT FOR DISCUSSION IN FIRST ISSUE

In the first number, which is scheduled to be issued early in July, project leaders will be given an opportunity to discuss methods of handling seed treatment work in its relation to various crops concerned in the different states. In this connection the following outline is offered with the thought that some one or several of the topics mentioned may suggest subjects on which contributions can be made.

A. Crop; treatment used; diseases, the nature and prevalence of which make the use of the measure desirable.

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MEMORANDUM FOR THE DIRECTOR

SUBJECT: [Illegible]

REFERENCE: [Illegible]

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B. Plan of work.

1. Survey activities.
2. Mechanical methods recommended for making the treatment.
3. Logical sequence of procedure in arousing interest in securing necessary number of demonstrations, and in getting general adoption of the practice. Attention might be given to such matters as:
 - (a) Strategy involved in location of community seed treatment work.
 - (b) Cooperation from growers' associations and others.
 - (c) Responsibilities that can be accepted by local people.
 - (d) Record taking.
 - (e) Plans for use of records.
 - (f) Publicity.
 - (g) Training of county agents.
 - (h) Literature.
 - (i) Goal.

C. Extent to which practice has been adopted.

D. To what extent can seed in your state be treated by growers' associations or by seedsmen or other commercial agencies before shipment to farmer buyers or retailers?

This spring the majority of the pathologists engaged in extension work have supervised activities involving some type of seed treatment work. Practically every man has an interesting and instructive story to tell with regard to the way in which he has handled some phase of this seed control work. Consequently it is hoped that every state which maintains a plant pathology project will have something to report on this subject.

NOTES FOR THIS NEXT ISSUE, WHICH WILL DEAL WITH SEED TREATMENT, SHOULD REACH WASHINGTON NOT LATER THAN JUNE 27. It will be appreciated if these notes are accompanied by suggestions relative to the method of assembling and editing this news letter, or topics which might profitably be discussed in future issues.

F. C. MEIER, Pathologist.

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T. G. MILLER, Pathologist.

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THE EXTENSION PATHOLOGIST

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UNITED STATES DEPARTMENT OF AGRICULTURE

VOLUME I.

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NOTES ON EXTENSION ACTIVITIES RELATING TO DISEASE CONTROL BY SEED TREATMENT

To what extent can losses caused by some of our plant diseases be reduced by seed treatment? Which methods work best in certain localities? How can these treatments be safely and effectively made a part of general farm practice? Can communities successfully operate central treating stations? Can seed companies advantageously treat certain kinds of seed before sending it into retail channels? These questions and others are discussed in the following notes received by The Extension Pathologist in reply to a questionnaire on seed treatment which was sent to State Extension Pathologists and others this spring.

POTATO SEED TREATMENT IN NEW YORK STATE

C. Chupp

It is no longer a question of the farmer whether potato seed treatment pays, for successful results have been demonstrated in every county in the state. Following is a table of the results of some of these demonstrations, which suggest the increase in yield that may be expected with the application of corrosive sublimate.

Year	No. of Counties	No. of Demonstrations	Average Yield of treated	Average Yield of untreated	Gain
1918	4	49	291 bu.	187 bu.	14 bu.
1919	7	28	237 "	189 "	48 "
1920	8	38	277 "	244 "	33 "
1921	8	42	181 "	159.4 "	21.6 "
1922	6	40	203 "	179 "	24 "
Average for five years					26.1 "

Notwithstanding this gain in yield, there are still a large number of growers who do not treat. It is not a matter of their being educated in the benefits of potato seed treatment, but merely a matter of time and labor. In order to overcome this difficulty several firms have built apparatus by which treating may be done for the farmer at very reasonable cost by the hot corrosive sublimate method. Approximately forty thousand bushels were treated in this manner in 1933, and the process seems so popular that many more bushels will be dipped next season. From one thousand to fifteen hundred bushels can be disinfected in one day, and when the apparatus is set in each community, in succession, and all the labor and materials furnished, the farmer is eager to take advantage of the opportunity given him.

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POTATO SEED TREATMENT SUCCESSFUL IN KANSAS

E. A. Stokdyk

We have tried to handle the pathology work mainly by plot demonstrations, or what is termed, farm demonstrations. We arranged from three to four of these in each major county and spent our efforts on carrying these through to completion and getting records on them. During June we had a potato tour, at which time we visited the plots which ran from a half acre to fifteen acres in size and the growers discussed the results that were showing and everyone present on the tour agreed that seed treatment was a big paying proposition. In the matter of taking records, will say that a questionnaire was sent to our mailing list of potato growers, asking, (1) How many acres of potatoes did you plant? (2) How many acres were planted with treated seed? (3) How many acres were planted with certified seed? Also they were asked to give this information for their community.

Replies to the questionnaire show over 4500 acres planted with treated seed. Of course there is some acreage for which we do not have records, but we have definite information on 4500 acres. At digging time the county agent and I took records on the treatment plots. In some cases we took the records by measuring ten rod rows in the treated and untreated plots. In other cases, we took two or three rows right through the field and in other cases the whole plot was harvested. It seemed to make very little difference which method was used from the standpoint of accuracy, for we secured about the same results either way. A tabulation of the records show in no case a decreased yield where the plot had been treated, and in every case there was an increase ranging 14 to 130 bushels. The average increase on 22 records taken was 41 bushels per acre.

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It is frequently true that although the subject matter solution of a farm problem has been worked out in the laboratory and on the experimental field, farmers in general have not adopted the resultant practice, even though their attention has been frequently called to it by bulletins and other types of literature. Of course, differences in soil and climate may make the measure impracticable in some sections; the cost of the equipment may be too great; the details of operation may not be sufficiently simple or clear that the average farmer can execute them. Perhaps it is some one or all of these things that the farmer has in mind when he studies our recommendation, then decides it is "just too hard work".

This obstacle has been discussed by Dr. Chupp in his article on potato seed treatment. He points to the hot mercuric chloride treatment as one means of saving time, and also tells of firms that make a business of seed treatment, thus relieving the farmer of the work. In Minnesota, the hot formaldehyde method originated by Dr. I. E. Melhus, of Iowa, has been used as a time-saver, and the work lessened by organized community effort. In Wisconsin, where the slower treatment with cold mercuric chloride solution is recommended, Mr. Vaughan has developed the use of a large wooden tank which will permit of quantity treatment on a community basis, thus saving time and labor in another way. The following articles, in which the work in Wisconsin and Minnesota is outlined in detail, contain valuable suggestions with regard to methods of bringing about a general adoption of the control measure. F. C. M.

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COMMUNITY POTATO SEED TREATMENT IN WISCONSIN

R. E. Vaughan

The potato growers in several Wisconsin communities are working together in the operation of treating seed with corrosive sublimate and as a result there has been a marked increase in the use of this material and a corresponding reduction in losses from scab and Rhizoctonia. The importance of this practice has been growing up in one of these communities, Almond, for nearly 30 years. There is one farmer there, Fred Dopp by name, who commenced using corrosive sublimate in 1894 and has continued to use it ever since. He combines careful selection and good cultivation with treatment, and his crop is uniformly free from scab and Rhizoctonia and always tops the market. Another pioneer in potato seed treatment is Louis Skoglund, Amherst. He has been a careful follower of our recommendations for potato improvement for many years. He and Fred Dopp of Almond have distributed much good seed in the vicinity. Thus by building on the experience of these men and others our extension service has been able to start something on a large scale.

The first plans for a community treating tank were made at farmers' institutes and county agent meetings in 1921, but the work wasn't started early enough to get anything done. However, County Agent Clark, who was then in Portage County, was convinced of the value of seed treatment and continued to agitate the question in season and out. As a result of this idea having been brought to their attention when the Amherst potato growers' association was looking for something to do this seemed a good plan to adopt. This work started by Clark has been continued by his successor, H. R. Noble.

Individually owned tanks have been in use for sometime so the idea of seed treatment was not new. However, the operation of a community tank was a new thing. The first problem was to get somebody to operate the tank. Fortunately there was a public spirited druggist in Amherst who finally assumed the responsibility of securing the corrosive sublimate, lining up the farmers on a schedule, and keeping the solution up to strength. Men of different training in the different localities were secured to operate the tanks, but they all secured corrosive sublimate from the Amherst headquarters. At Almond a hardware dealer built a tank and operates it, because he says he figures that anything which helps make better potatoes for his farmers will make better business for him. At Blaine a cross-roads auto repair man does the work; at Bancroft a county postmaster; at Iola a potato buyer; at Custer two potato buyers together; and at Waupaca, where there are two tanks in operation, a potato buyer and a seed company.

Farmers usually bring their potatoes to the central tanks



Fig. 1. The Iola tank is "one crate deep". As the crates are placed in the tank, the solution rises so that all the potatoes are finally covered.



Fig. 2. The Iola tank is "one crate deep". As the crates are placed in the tank, the solution rises so that all the potatoes are finally covered.

in farm wagons holding about 50 or 60 bushel crates. Therefore, in constructing tanks the idea has been to make them of sufficient capacity to handle a load at one time. The drivers assist in getting the crates into the tanks and are then free to go about other business for the length of time the potatoes are to be treated. The one-hour treatment in solution maintained at 1-1000 strength has given satisfactory results. At first the crates were lifted into and out of the treating solution by hand, but later some of the mechanically-minded operators devised a plan whereby the crates are set on a platform which is lowered into the solution by means of a windlass. At Blaine the lifting is done by means of an inch rope having two turns around a revolving spruce pole about six inches in diameter. The pole is turned by a pulley connected by a belt to a small gas engine. The tanks have different dimensions depending on the style of crate in use in the vicinity and on the method of handling. If they are lifted by hand, as at Iola, it is most convenient to have the tank one crate deep; but if they are handled by machinery as at Blaine, it is sometimes better to have the tank deep enough to accommodate two tiers of crates one above the other. It is easier to make a tank water tight, if it is not too deep.

After treatment, the potatoes are hauled back to the farms and usually allowed to remain in the crates about 10 days before cutting and planting. During this hardening off period they are kept in half light as in a shed or barn floor and protected from hens or other farm stock.

The success of any new venture in farm operation depends not only upon the operation itself but also upon the results secured among the farmers. In the venture of community potato seed treatment there is almost complete satisfaction. Many farmers who were skeptical at first have been convinced of the value of treatment on their own farms and now will plant nothing but treated seed. It is difficult to get good check plots on many farms because the seed is all treated. The dealers say they can tell whether a farmer used treated seed just by looking at his load when he drives across the scales.

Clean, smooth market stock is now commanding a better place at the local shipping points than ever before. This has been brought about in part by the opportunity for selection by the buyers but especially by the agitation and education which has been conducted from the Wisconsin Department of Markets by the federal state grading inspectors. A farmer doesn't have to have his loads docked many times before he learns to get into the game and use all possible means of producing the better stuff that tops the market. This has been a great stimulant to potato seed treatment.

The tanks in operation are made of matched pine plank or reinforced concrete. The selection of material depends upon

the choice of the local group in charge of the work. Any tank that will hold water to a depth of one or two crates and is large enough to accommodate a reasonable load is satisfactory.

The cost of a tank has varied from \$50 to \$70 depending on the time and material required to make it. Tanks have been provided in different ways; they have been donated by business men, supplied by the operator, or furnished by a group of interested farmers.

The price of treating potatoes in community tanks has always been kept at the lowest point, from 2-1/2 to 4 cents a bushel depending on the ownership of the tank. If the operator built the tank and operated it himself, it was felt only just that he should charge more than when somebody donated the tank or when the potato growers' club chipped in and had it made themselves.

The growth of the work speaks for itself. The first tanks treated 3,000 - 4,000 bushels, and last year from 25,000 to 30,000 were handled. The influence of the community tank idea will be farreaching in at least two ways: (1) New communities will take up the work based upon the success of those already in operation; (2) Men not conveniently located with reference to a community tank will secure tanks or barrels and treat their own seed, thus increasing the control of scab and Rhizoctonia.

The extension specialist in plant diseases has been cooperating in this community work from its inception. Suggestions have been made to the County Agents and their plans of operation approved by the specialist before starting to work. In most cases either Mr. J. W. Brann or the writer have accompanied the Agents in selecting a local handler of the tank and in picking out a good convenient location for the work to be done. During the growing and digging period the Agents have been assisted in follow-up work in order to secure results and answer any questions that might be raised.

POTATO SEED TREATING CENTERS POPULAR IN WINONA
COUNTY, MINNESOTA

R. C. Rose

Hot Formaldehyde Saves Time

The hot formaldehyde quick method for treating seed potatoes has been rapidly gaining in popularity among the Minnesota potato growers. With the usual rush of farm work in the spring of the year and the noticeable shortage of help this past season, it was no wonder that many potato growers showed keen in-

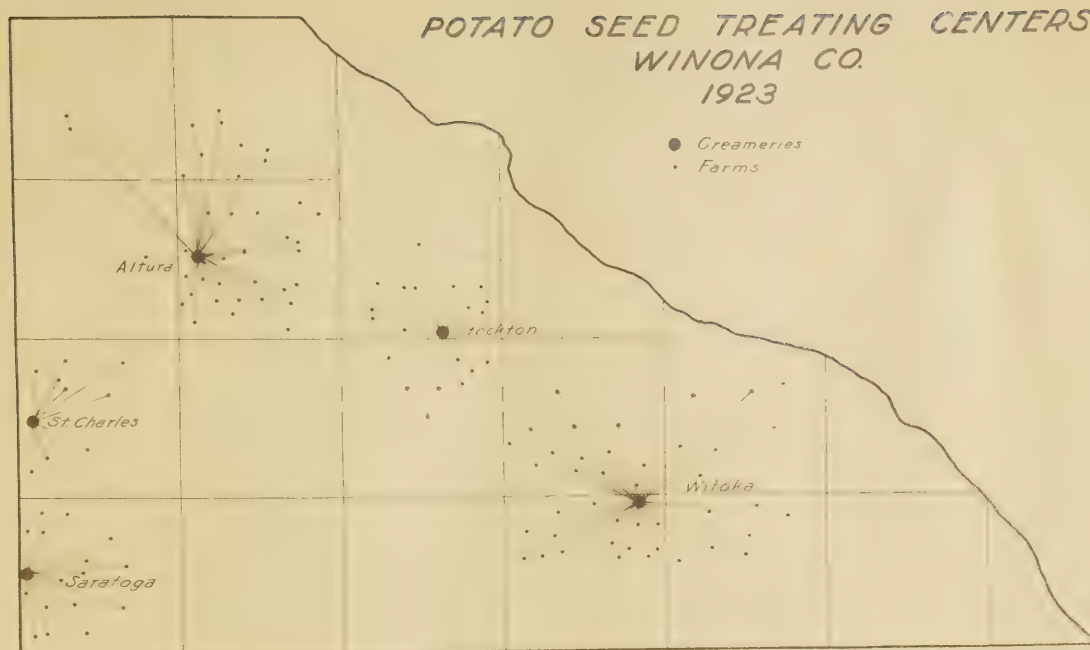


Fig. 3. Potato seed treating centers, Winona Co. 1923



Fig. 4. Treating seed potatoes at a creamery in Winona County, Minnesota.

terest in a method of seed treating that promised to save considerable time.

The Red River Valley potato growers with large quantities of seed to treat set up individual equipment on their farms to handle this work, but the growers with small acreages found it more satisfactory for several to cooperate and use the same equipment.

County Agent McNulty of Winona County, after explaining the method to his potato growers, arranged to establish seed treating centers in various parts of his territory. Several weeks before the treating was to be done, lists were left at five different creameries and growers were asked to sign if they wished to have their seed treated, and at the same time to indicate how many bushels they planned to treat. Of course preliminary arrangements had been made with the creamery to supply steam for heating the water, at a small charge, and it was understood that the equipment was to be set up outside of the creamery. Tanks, lumber for loading platforms, and steam hose were either rented from some one in the neighborhood or purchased and equipment set up the day before operations were to start. The local committee in charge hired one man to supervise the treating work and he was given complete instructions by the extension specialist and county agent in all details of treating seed potatoes.

To cover operating expenses, farmers were charged just enough to meet costs, which in most cases ranged from three to four cents per bushel. The operator, besides explaining the method and helping the farmers as they came in, was also required to record certain data on each lot that was treated. This record included name of grower, quantity of seed treated, condition of seed in reference to disease, variety, whether grower had ever treated seed before, and whether he was planting some untreated seed as check plot. This record was kept in a small notebook which was turned over to the county agent at the close of the seed treating season.

The large dots on the accompanying map of Winona County show the location of the seed treating centers and the small dots radiating out show the location of farms using seed treated at the treating centers. The table gives a summary of data recorded at the Winona County treating stations.

Seed Treat- ing Stations:	Potatoes Treated Bushels	Farmers Served	Farmers not treating seed in previous year:	Cost of treating each bushel
Stockton	473	20	15	3¢
Witoka	1321	42	35	3¢
Saratoga	181	16	14	4¢
St. Charles	217	9	5	4¢
Altura	850	56	not recorded	*

* Material and equipment donated by local merchant.

CEREAL SEED TREATMENT IN INDIANA

Charles Gregory

July 10, 1923.

For the first copy of the news sheet "The Extension Pathologist", I would like to offer some information on the subject of hot-water treatment as it has been conducted in Indiana, hoping that I may hear more concerning the subject from other men who are pushing this project. I will outline my work as closely as I can, following the outline given in your memorandum.

A. Crops: Both barley and wheat have been treated with hot water, the wheat against loose smut and stinking smut and the barley against loose and covered smut. The loose smut of wheat is prevalent

throughout the state but is less severe in the north, usually averaging about 5%. In the central and southern part of the state, beginning on a line with Indianapolis, the amounts of loose smut often mount to 30% or 35%, averaging between 10% and 15%. In the extreme southern part of the state, particularly in the eastern part, wheat is not so widely grown and though it is diseased the treatment is not widely practiced.

The barley smuts are very severe almost always taking a quarter to a third of the crop. However, barley is not extensively grown and the treatment is only being carried out in Harrison County this year, but it has been successfully practiced in Jasper and Hancock Counties.

I am planning on using chlorophol treatment with barley this fall, having obtained several samples of Semesan from the DuPont Company.

B. Plan of Work:

1. The hot water treatment has been followed so long in Indiana that surveys for the amount of smut are not needed. We know, fairly accurately, where the treatment is necessary.

2. The methods recommended for the treatment in the past were, first, the barrel and sack method, using boiling water to maintain the temperature of the treating water and treating the wheat, a half-bushel at a time, in a sack. Next, the large drum was devised which held four or five bushels of wheat and in which the wheat could be stirred by the revolving of the drum. This method was perfectly satisfactory but rather expensive.

Conditions have made it necessary that the treatment be more widespread and in order to accomplish this we have had to deviate a little from the central treating station idea and to put the work more in the hands of the farmers. To do this we are using small treating stations consisting of a large tank in which the water is heated by steam and to which the farmers come and treat their wheat by hand. We have made one change which doubles the speed of treating. When the tank is large enough each man can handle a bushel of wheat by handling two sacks, each containing a half-bushel of wheat. By this method a farmer can treat four bushels per hour. With a twelve foot galvanized watering trough we can treat about twenty-four bushels an hour. The steam is furnished in various ways, sometimes from an elevator but more often from a threshing machine.

3. (a) The first step in developing the treating work has been to treat small amounts of wheat for a number of men and then let them see from the results that the smut is controlled. Next, the yield and quality of wheat from this treated seed is obtained and the records published. The greatest difficulty that we are now encountering is the fact that the smut, being wind borne, quickly reappears thus necessitating the treating of wheat

over large areas.

(b) In order to overcome this difficulty I am trying to interest communities in the development of smut-free wheat. This work is being confined to three or four counties so that we can test out the practicability of the methods used. In order to do this we are endeavoring to get the cooperation of interested groups of farmers in certain communities.

(c) By the recent development that we have made in the treatment the responsibility for the treatment is being taken by the farmers themselves but the leadership in the county still remains in the hands of the county agents. If the widespread community idea is to be accepted it can only be accomplished through the development of leaders in the community. I have found that the farmers themselves are perfectly capable of doing the work by themselves. The only precaution that is needed is that they have accurate thermometers, and, to overcome this difficulty, I am testing thermometers for the farmers and the county agents.

(d), (e), (f) I have found that our greatest difficulty is getting records. Many times treating is being done and I know nothing of it, but in most cases the county agents do not report the results of the work. Whenever we get outstanding cases they are made the subject of a newspaper story throughout the year. In the fall we publish results of the treatment and urge the treating of wheat. In the winter and spring further stories of the same nature are put out. In the summer and during the time when the smut shows in wheat stories concerning the amounts of smut found and the results of various farmers in the control of the disease are given.

(h) The only literature that we have is bulletin 100 on the hot water treatment.

(i) The goal that I believe should be set for the treatment is to get good wheat growers interested in improving the crop, treating their wheat and using this seed as a center from which the improved seed can be disseminated.

I believe that this work will be most effectively developed by this method rather than trying to get widespread treatment by the farmers of the state. I am also finding that certain varieties are less seriously affected than others, for example, the Rudy wheat does not seem to be badly smutted. In the northern part of the state Turkey Red is less seriously affected.

C. I believe that this part of the outline has been answered in the previous statements. I can only repeat that the prac-

tice has been very generally developed throughout the state in practically every county and that we have now come to the point where it seems that the work must be developed through a few interested seedsmen spreading the influencing of the treatment by the use of their improved treated seed. This is the problem that is facing me now and one on which I will welcome any suggestion.

September 25, 1923.

I might add to what has already been said in my previous letters to you that the copper carbonate treatment of wheat is sweeping over the state like wildfire. The stinking smut in most places seems to be much more common and serious this year than usual, and, although the interest in wheat is rather low this year, the ease of this method of treating is attracting much attention. All the county agents and farmers need is the assurance that the method is good. I have been told by certain growers that the seedsmen and elevator men have said that they would treat the wheat in large quantities of the method proves to be satisfactory.

The hot water treatment this year is being taken up on the community plan and I am getting more evidence every day that the treatment, though it does not hold the wheat completely smut-free for a long time, still it does not exert its influence for two to four years after the treating. It is our plan now to put the treatment in the hands of the farmers. Owing to the lack of interest in wheat this year it is probable that the amount of hot water treating will be small. However, I am trying to improve the quality, so to speak, by having the farmers do the work themselves in local community stations.

THE COPPER CARBONATE METHOD FOR CEREAL SEED TREATMENT
IN WASHINGTON

George L. Zundel

Our outstanding problem this year is the establishing of copper carbonate as a fungicide to control stinking smut of wheat. To illustrate our methods of introducing this into the various counties, I am going to take Grant County as an example.

Early this spring I spent three days with the county agent, at which time we held six meetings in as many communities. The method of applying the dust was very carefully explained and then an actual demonstration was conducted, in which the type of treating machine was shown and the method of treating. At these six meetings we had a total attendance of 224 farmers, of which 100 were in attendance at the meeting at Ruff. According to the 1920 census there are in Grant County 159,412 acres of wheat. As a

piece of follow-up work, a survey was made to determine how widely the practice of using copper carbonate had been followed and we found that there 55,000 acres where copper carbonate had been used as the fungicide to control smut. In the area around Ruff 90% of the wheat acreage was treated with copper carbonate.

A preliminary estimate indicates that at least 140,200 acres of wheat will be sown this year with seed that has been treated with copper carbonate in Grant County.

A history of the use of this powder might be of interest to you. In the 18 counties east of the Cascades where wheat is grown to any extent, there are, according to the 1920 census, 2,335,346 acres of wheat. In 1920 and 1921, County Agent Scott of Franklin County and myself were able to start ten acres of wheat treated with copper carbonate, which were used as a demonstration to compare it with smut control against the old treatments of bluestone and formaldehyde.

This was the first copper carbonate used in the Pacific Northwest. In 1921 and 1922, this practice was carried to 13 counties in the State, and we had in demonstration work over 10,000 acres of wheat that had been treated with copper carbonate.

Following these demonstrations, accompanied by the usual publicity, we found that in 1926 we had 754,421 acres of wheat which had been treated with copper carbonate or approximately 31% of the total wheat acreage.

A preliminary survey of the acreage of wheat going in in 1923-1924 based on the sales of copper carbonate, indicates that we will have at least 1,500,000 acres of wheat treated with copper carbonate.

We get better stands of wheat by planting less seed per acre, and in good many cases we get a larger yield. The better stands accomplish one other thing and that is that there are fewer weeds where copper carbonate is used. The Lind Experiment Station in Central Washington has also demonstrated that the use of copper carbonate allows the wheat plant to make a more vigorous growth, thus cutting down the injury from wire worms.

CEREAL SEED TREATMENT IN VIRGINIA

James Godkin

In regard to further seed treatment work I would like to say that we still have another major project on the treatment of seed for the control of loose smut. Hot water method. At least eight counties of the State have asked us to carry on work on this problem with them. In Botetourt County for example, we have treated to date about 150 bushels, most of which is for certified growers. This was done at canning factories where live steam and tanks were available to do the work. In this connection we have put out an Extension Circular on the treatment for control of this disease. This work has gone along smoothly in Botetourt County because of the fact that this County is one of the largest tomato growing counties in the State, hence the large number of canning factories helped us greatly in carrying on their treatment work in this county. In all something over 200 bushels will be treated in this County this fall. Other counties will have treated from 15 to 50 bushels. We believe this is a considerable showing since in many of the counties little or nothing had been done in the past seasons regarding the control of this very serious disease of wheat in Virginia.

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Study of Plans of Work submitted by the states maintaining extension projects in Plant Pathology, indicates more or less universal interest in the various cereal seed treatments. Owing to his numerous contacts with the work in various states, Dr. W. H. Tisdale, Office of Cereal Investigations, U. S. Department of Agriculture, is particularly well able to summarize the present status of the cereal seed treatment work. F.C.M.

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THE PRESENT STATUS OF CEREAL SEED TREATMENTS

W. H. Tisdale

Sometime ago you asked me to give you a brief statement concerning our recommendations for the control of cereal smuts. It seems that different treatments and different modifications of the same treatment are being recommended in different localities for the control of the various smuts of cereals. There is no doubt a very good reason for this, due to the different soil and weather

conditions and to a certain extent to the different varieties sown in different sections of the country.

Bunt or Stinking Smut of Wheat

The treatments employed at present for the control of this disease are copper carbonate, copper sulphate-lime, and formaldehyde. With one or two exceptions copper carbonate is proving to be more satisfactory than the other two treatments. In the Pacific Coast States where this treatment was first used in this country the results have been highly satisfactory. Although the control is not perfect the stands of wheat from treated seed are much better than those from untreated seed and the yields are generally better. Bunt is controlled equally as well as with copper sulphate-lime and formaldehyde. In Idaho, according to the State pathologist, bunt is not controlled as satisfactorily with copper carbonate as with copper sulphate-lime. The figures given in the report from Idaho, however, show that the stands were increased considerably and the yields were generally better where copper carbonate was used and the percentages of bunt in wheat grown from seed treated with copper carbonate were only slightly higher than those in wheat grown from seed treated with copper sulphate. According to investigations in the middle western and eastern States copper carbonate is very satisfactory for the control of bunt. We feel safe in recommending copper carbonate for the control of this disease.

Flag Smut of Wheat

Copper carbonate will protect wheat from infection by flag smut where the spores are seed borne. As in the case of bunt, however, it does not protect wheat from infection by spores in the soil but is just as satisfactory as either copper sulphate-lime or formaldehyde in this respect. We do not feel that it is so important to recommend seed treatment in the case of flag smut, due to the fact that we have a number of highly resistant varieties of wheat. However, if susceptible varieties are to be grown we recommend copper carbonate as one of the best materials for seed treatment. Treatment, of course, is not advisable except in the infested areas which are now known to occur in Illinois, Missouri, and Kansas.

Loose Smut of Wheat

Where loose smut of wheat is in sufficient abundance to be an economic factor we have been recommending the modified hot-water treatment. (Soak the seed in cold water for 4 to 6 hours then in hot water at 54° C. (129°F) for 10 minutes.)

We have found that the modified hot-water treatment may cause different degrees of seed injury depending upon the condition of the seed coat. If the seed coat is broken the seed is subject to injury by this treatment. We recommend making a soil

germination test, if possible, before sowing in order to determine the amount of injury from treatment so that the rate of seeding may be increased to compensate for the seed killed. The hot-water treatment is especially recommended for treating seed for sowing in fields where seed wheat is to be grown. The community seed treating plant which has been in operation for sometime in Indiana and Virginia should prove very satisfactory for applying the hot-water treatment.

A simplified hot-water treatment recently has been developed. This treatment causes less seed injury than the modified method but its practical value has not definitely been determined as yet and we hesitate to recommend it generally until further tests are made.

BARLEY SMUTS.

Both the hot-water and formaldehyde methods of treatment are being used to some extent in the control of barley smuts. In recent investigations it has been found that for at least some varieties of barley the formaldehyde treatment controls loose smut as effectively as does the hot-water treatment. These methods proved to be equally satisfactory in the control of both the smuts of barley but both caused seed injury, especially on certain varieties. Tennessee Winter barley was not injured but in fact the yields were actually increased when these methods of treatment were used. Yields of Greece and Wisconsin Winter barleys, however, were decreased where the hot-water method was used. Such varieties as Texas Winter, Han River, and Cusado yielded on an average equal when seed was treated and when sown untreated. We feel that further investigations should be conducted along the lines of varietal and local differences before any definite recommendations can be made. I might say that the strengths of formaldehyde used and the time of treatment in hot water were somewhat below what is generally recommended in our experiments, but still seed injury resulted in the case of some varieties. We soaked in hot water for only 10 minutes where 13 minutes often is recommended. We used one pint to 40 gallons of formaldehyde and soaked the seed for 10 minutes. Stronger solutions and longer periods of soaking are often recommended in the case of formaldehyde treatment.

Copper carbonate can not be recommended for the control of barley smuts. In two years of investigations at Arlington Farm the smuts were reduced very little if any where copper carbonate was used.

We have been using a number of organic mercury compounds for the control of barley smuts. Two of these, namely, Chlorophol and Semesan, have given excellent results when used at the rate of .3 of one per cent solution and the seed soaked for one hour. No seed injury is caused; the stands are better than those from untreated seed; and the yields have been decidedly improved by

the use of these materials. It remains to be seen, however, as to whether these chemicals will be satisfactory on all varieties and under various local conditions.

OAT SMUTS.

We continue to recommend the formaldehyde treatment for smuts of oats. Copper carbonate has given good results in some sections of the country but on the whole it has not proved satisfactory. The organic mercury compounds have given excellent results in our experiments at Arlington Farm in one season's experiments but we do not care to recommend them until further tests have been made.

We use formaldehyde at the rate of one pint to 40 gallons and soak the seed for 10 minutes. This has given us better results than the dry method and the sprinkling method, which are used in other sections of the country. Here again we feel that the method to be used depends on local conditions. The method in common use in any particular locality is in all probability the one which should be followed.

KERNEL SMUT OF SORGHUM.

Although a large number of chemicals have been used in our cooperative sorghum smut investigations we are still recommending the wet formaldehyde treatment. The dry formaldehyde treatment has given good results but causes more seed injury than the wet method. Some of the other materials including one dust have given good results but considering the probable cost of these materials and the limited experiments conducted we do not feel that it is advisable to recommend them as yet.

SWEET POTATO SEED TREATMENT IN KANSAS

E. A. Stokdyk

We arranged similar demonstrations (referring to potato demonstrations) on treating sweet potatoes with corrosive sublimate and arranged them in a similar manner. The results were surprising to all of us, for we obtained increased yields running from 12 to 101 bushels per acre due to seed treatment. Mr. W. R. Beattie, who was with me while we took these records, was more surprised than I was, because as far as we could determine, there was little or no disease showing up in either treated or untreated when we took the records. However, the growers all stated that the treated seed produced less plants, but they were of the opinion that the treated seed produced more vigorous plants which started off better and they also stated that the treated seed did not show misses in the rows, as did the untreated, which perhaps accounts to a large extent for the increased yield.

Hill selected sweet potatoes for disease control, that is seed selected in 1922, showed a reduction of stem rot and gave us considerable promise as a means of eliminating this disease through seed selection, for owing to the fact that infected plants were evidently attacked late in the season and very few plants in selected stuff died early in the season, it was hard to trace what stem rot was there to any other than soil infection.

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TREATMENT OF TOBACCO SEED IN VIRGINIA

James Godkin

Treatment of tobacco seed for the control of the two Bacterial diseases, Blackfire and Wildfire, was begun at the Experiment Station on Monday, January 29th, last, and up to March 23rd, 360 lots of tobacco seed had been treated, varying in size from a fraction of an ounce to as much as 35 pounds. We believe that it is safe to say that these lots which we treated were so divided and distributed that from twelve to fifteen hundred farmers of the State eventually received treated seed last spring. I might add further that this was the situation in spite of the fact that practically no advertising was done either before or during the period of treatment. We carried on the germination tests, of course, of the treated seed as compared with the untreated and we found no injury whatever from treatment. There is also evidence that very many farmers have treated their own seed this year. Of course, we have been advising the other precautionary measures, such as boiling old canvas, and exercise of care in handling the plants, etc.

This seed treatment work was followed up later in the season by the plant bed inspections, and Dr. Fromme and myself inspected personally over 100 plant beds where both treated and untreated seed were used. During this work, due to unfavorable season, we found little or no disease in any of the beds, but still later in the summer, we followed this work up again by further inspection of the full grown plants in the field and here we found our best check on the treated as compared with the untreated seed. We found cases where the untreated seed had developed the Blackfire disease and we noted in the same communities the Blackfire disease on the untreated plants but no disease where the plants were grown from treated seed. In this connection I would like to call your attention to Volume No. 7 of the Plant Disease Reporter, page 88, a note on reports from Kentucky on the Angular Leaf Spot of Tobacco

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WATERMELON ANTHRACNOSE CONTROL IN GEORGIA

T. H. McHatton

We have had a good deal of experience in this state treating watermelon seeds against anthracnose with bichloride of mercury. For the past two or three years the Sowega Melon Growers Association, with headquarters at Adel, has treated thousands of pounds of seeds. This work followed demonstrations that were inaugurated with your assistance by the Horticultural Division of the State College of Agriculture some three years ago. Results have been so satisfactory that it is practically understood that the growers producing melons for the Sowega Association all treat their seed.

Unfortunately, a great many growers have gotten the idea that seed treatment is the only measure necessary in preventing anthracnose. They, however, are rapidly getting over this idea and spraying is becoming more common in the melon fields.

COMMERCIAL SEED TREATMENT

There is a strong possibility that in the future seed treatment by the farmer will be unnecessary in the case of certain crops. In his annual report to the Director of Extension, New York State, Dr. M. F. Barrus tells of cabbage seed treatment by the seed house in 1922.

"One large cabbage seed firm is planning to treat all the seed which is put out and advised with extension specialists regarding the best machinery for treating seed in large quantities. Another cabbage seed producer wanted to free his stock of blackleg, so a carefully planned demonstration has been outlined for use next spring (1923). This consists in having an isolated plot in which tested seed is planted. Every precaution is taken to keep out contamination. These demonstrations with the seed producers are very important for if the source of all the seed stock can be made clean, little work need be done with the individual farmer." (Barrus)

Undoubtedly there are other seeds that could profitably be handled in this way. What do you consider to be the possibilities in this line of activity in your state? F.C.MM

EXTENSION LITERATURE AND ILLUSTRATIVE MATERIAL

Exhibits at Cincinnati: In the announcement of the Fifteenth Annual Meeting of the American Phytopathological Society, which was issued recently, the following reference was made to Phytopathological Exhibits:

"There will be the usual opportunity for exhibiting specimens, slides and other material. One of the main features this year will be illustrative material used by extension and teaching pathologists in presenting their subject to classes, and to the general public. It is hoped that there will be many contributions to this exhibit. A room for this display will be secured as close to our regular meeting room as possible. Bring your exhibit with you, or send it, transportation prepaid, to O. T. Wilson, Dept. of Botany, University of Cincinnati, Cincinnati, Ohio, and mark on the outside of the package the name of the sender and the words "Phytopathological Exhibit."

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Lantern Slides on Pathological Subjects: During the past twelve months requests for a loan of lantern slides on pathological subjects have been frequent. These have come not only from state extension pathologists, but from county agents as well. In order that such requests may be complied with, we now have in process of preparation a number of sets of slides which deal in a general way with diseases of various crops. As many duplicates of each set as seems desirable will be prepared in color. The slides dealing with each subject, when sent to the field, will be accompanied by a mimeographed syllabus, so that county agents and others who may not have a detailed knowledge of the subject, may, by reading this as the slides are shown, give an interesting and accurate presentation. This work is made possible by the Cooperation of the Visual Instruction and Editorial Section, of the Office of Cooperative Extension. A series entitled "The Helworm Disease of Alfalfa", by Dr. G. H. Godfrey, of the Bureau of Plant Industry, will soon be ready for use.

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The Eelworm Disease of Alfalfa: Farmers' Bulletin 1345, "Root-knot; Its Cause and Control," is just off the press. It is a revision and extension of a former bulletin on root-knot, and contains several distinct improvements. Several new illustrations which are contained therein bring out clearly the nature of the disease on various crops, and the relationship of the causal organism. It has considerable added printed matter, as compared with the former bulletin, giving, in the different sections, the increased knowledge resulting from recent experimental work. In addition, it is organized in such a way as to bring out prominently the features of major interest, particularly the practicable control measures.

Department Circular 297, "The Eelworm Disease; a Menace to Alfalfa in America," also just released, is designed primarily to secure aid from the extension forces throughout the country in the way of a survey to increase our information on the distribution of the disease. Of the upwards of eight million acres of alfalfa grown in America, only a thousand or so are now known to be affected. When fairly complete information is had as to the actual extent of occurrence of the eelworm disease, it is anticipated that measures looking toward prevention of spread can be put into practice, prevention of first occurrence being clearly the best control. This circular contains a description of the disease, both as it appears in the field and on the individual plant, supplemented by good illustrations, together with brief information on the cause, manner of spread, and suggested means of control.

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ANNOUNCEMENTS.

Regarding The Extension Pathologist: I wish to thank the men whose names appear on our index sheet for their cheerful assistance in the preparation of the first number of The Extension Pathologist. This news sheet is intended as a medium in which Extension Workers can discuss methods of conducting work in plant pathology. It will be issued from time to time as sufficient material comes to my desk from the states. At this time, while we are making plans for future numbers, it would be helpful if

all State Extension Pathologists would send in a list of topics suitable for discussion in numbers to be issued in the calendar year 1924. These lists should reach me by December 15. Prompt attention to this matter will be appreciated.

Fred C. Meier, Extension Pathologist,
Office of Cooperative Extension,
U. S. Department of Agriculture.

all State Extension Pathologists will send to a list of persons
to whom the attention is directed to be placed in the column
marked "List". These lists should reach me by December 15. Proper
attention to this matter will be appreciated.

Frank C. Kater, Extension Pathologist,
Office of Cooperative Extension,
U. S. Department of Agriculture.